# 2.5 Waste Management and Chemical Inventories

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## 2.5.1 Waste Management

Waste produced from Hanford Site cleanup operations is classified as either radioactive, non-radioactive, mixed, or toxic. Radioactive waste is categorized as transuranic, high-level, and low-level. Mixed waste has both radioactive and hazardous non-radioactive substances. Hazardous waste contains either dangerous waste or extremely hazardous waste or both, as defined in WAC 173-303. Hanford's hazardous waste is managed in accordance with WAC 173-303.

Radioactive and mixed waste is currently handled in several ways. High-level waste is stored in single- and double-shell tanks. Low-level waste is stored in the tank system, on storage pads, or is buried. The method used to manage low-level waste depends on the source, composition, and concentration of the waste. Transuranic waste is stored in vaults or on underground and aboveground storage pads from which it can be retrieved.

Approximately 33 Hanford Site generators (WAC 173-303-040) have the capacity to produce dangerous waste during site cleanup activities. An annual report lists the dangerous waste generated, treated, stored, and disposed of onsite and offsite (DOE/RL-2001-08). Dangerous waste is treated, stored, and prepared for disposal at several Hanford Site facilities. Dangerous waste generated at the site also is shipped offsite for disposal, destruction, or recycling.

Non-dangerous waste generated at the Hanford Site historically has been buried near the 200 Areas Solid Waste Landfill. Beginning in 1999, non-dangerous waste has been disposed at the Roosevelt Regional landfill near Goldendale through a contract with Basin Disposal, Inc. Since 1996, medical waste has been shipped to Waste Management of Kennewick. Asbestos has been shipped to Basin Disposal, Inc. in Pasco and the onsite Environmental Restoration Disposal Facility. Since 1996, non-regulated drummed waste has been shipped to Waste Management of Kennewick.

Non-dangerous waste originates at a number of areas across the site. Examples include construction debris, office trash, cafeteria waste, and packaging materials. Other materials and items classified as non-dangerous waste are solidified filter backwash and sludge from the treatment of river water, failed and broken equipment and tools, air filters, uncontaminated used gloves and other clothing, and certain chemical precipitates such as oxalates. Demolition waste from 100 Areas decommissioning projects is buried in situ or in designated sites in the 100 Areas.

Annual reports document the quantities and types of solid waste generated onsite, received, shipped offsite, and disposed of at the Hanford Site (HNF-EP-0125-13). Solid waste program activities are regulated by the *Resource Conservation and Recovery Act* and *Toxic Substances Control Act*, discussed in Section 2.2. Solid waste quantities generated onsite, received from offsite, shipped offsite, and disposed of at the Hanford Site from 1995 through 2000 are shown in Tables 2.5.1 through 2.5.3. Table 2.5.4 provides a detailed summary of the radioactive solid waste stored or disposed of in 2000.

**Table 2.5.1. Quantities of Solid Waste[a] Generated on the Hanford Site, kg (lb)**

| Waste Category | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| Mixed | 132,000 (291,000) | 199,000 (439,000) | 442,000 (975,000) | 509,000 (1,120,000) | 421,000 (928,000) | 441,000 (973,000) |
| Radioactive | 1,890,000 (4,170,000) | 3,870,000 (8,530,000) | 6,590,000 (14,500,000) | 1,470,000 (3,240,000) | 957,000 (2,110,000) | 700,000 (1,544,000) |

(a) Solid waste includes containerized liquid waste.

**Table 2.5.2. Quantities of Solid Waste[a] Received from Offsite, kg (lb)**

| Waste Category | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| Mixed | 52,800 (116,000) | 2,070 (4,560) | 3,560 (7,850) | 267 (589) | 1,306 (2,880) | 1,381 (3,045) |
| Radioactive | 1,310,000 (2,890,000) | 1,670,000 (3,680,000) | 1,430,000 (3,150,000) | 2,870,000 (6,330,000) | 2,325,700 (5,128,000) | 6,958,000 (15,343,000) |

(a) Solid waste includes containerized liquid waste. Solid waste quantities do not include United States Navy reactor compartments.

**Table 2.5.3. Quantities of Hazardous Waste[a] Shipped Offsite, kg (lb)**

| Waste Category | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|
| Containerized | 224,000 (494,000) | 590,000 (1,300,000) | 110,000 (243,000) | 65,700 (145,000) | 1,732,700[b] (3,820,600) | 33,200[b] (73,220) |
| | | | | | 70,000[c] (154,000) | 315,500[c] (695,700) |
| Bulk Solids | 478,000 (1,050,000) | 0 | 335,000 (739,000) | 47,500 (105,000) | 402,300[d] (887,000) | 0 |
| Bulk Liquids | 130,000 (287,000) | 98,800 (218,000) | 5,025,000 (11,100,000) | 41,800 (92,200) | 0 | 0 |
| **Total** | 832,000 (1,840,000) | 689,000 (1,520,000) | 5,470,000 (12,100,000) | 155,000 (342,000) | 2,205,000 (4,862,000) | 348,700 (768,883) |

(a) Does not include *Toxic Substances Control Act* waste.
(b) Hazardous waste only.
(c) Mixed waste (radioactive and hazardous).
(d) Includes 399,875 kg (882,000 lb) of material associated with the extraction of carbon tetrachloride from soil.

**Table 2.5.4. Radioactive Solid Waste Stored or Disposed of on the Hanford Site, 2000**

| Constituent[a] | Quantity, Ci | | |
|---|---|---|---|
| | Low Level | Low-Level Mixed Waste | Transuranic |
| Tritium | 3,690 | 38.7 | [b] |
| Carbon-14 | 0.444 | [b] | [b] |
| Manganese-54 | 2.78 | [b] | 42.6 |
| Iron-55 | 40.7 | 47,700 | [b] |
| Cobalt-60 | 24,400 | [b] | 38.3 |
| Nickel-63 | 283 | 111,000 | [b] |
| Strontium-90 | 229 | 28.6 | 26,500 |
| Yttrium-90 | 229 | 28.6 | 26,500 |
| Technetium-99 | 0.0842 | 0.0289 | 1.64 |
| Iodine-129 | 0.0000015 | 0.0000496 | [b] |
| Cesium-137 | 544 | 22.4 | 31,900 |
| Barium-137m | 514 | 21.2 | 30,200 |
| Uranium-233 | 0.0433 | 0.000175 | [b] |
| Uranium-234 | 0.194 | 0.00197 | [b] |
| Uranium-235 | 0.01 | 0.000116 | 0.000325 |
| Uranium-236 | 0.00262 | 0.000195 | [b] |
| Uranium-238 | 0.58 | 0.00214 | 0.0187 |
| Plutonium-238 | 0.371 | 0.0941 | 129 |
| Plutonium-239 | 1.2 | 0.105 | 208 |
| Plutonium-240 | 0.444 | 0.0517 | 93 |
| Plutonium-241 | 22.2 | 0.692 | 5,090 |
| Plutonium-242 | 0.000181 | 0.0000000133 | 0.0698 |
| Americium-241 | 0.808 | 0.136 | 567 |
| Curium-244 | [b] | [b] | 131 |
| **Total** | 29,959 | 158,841 | 121,401 |

(a) See Appendix A, Table A.5 for radionuclide half-lives.
(b) Value was not reported or was insignificant relative to other waste types.

The quantities of liquid waste generated in 2000 and stored in underground storage tanks are included in the annual dangerous waste report (DOE/RL-2001-08). Table 2.5.5 is a summary of the liquid waste generated from 1995 through 2000, which are stored in underground storage tanks.

## 2.5.2 Chemical Inventories

Types, quantities, and locations of hazardous chemicals are tracked through prime contractor-specific chemical management system requirements (see Section 2.2.3), which include compliance activities associated with the Emergency Planning and Community Right-To-Know Act (see Section 2.2.5). The *2000 Hanford Site Tier Two Emergency and Hazardous Chemical Inventory* (DOE/RL-2001-0010) was issued in February 2001 in compliance with Section 312 of the Act. Table 2.5.6 summarizes the information reported, listing the 10 chemicals stored in greatest quantity on the Hanford Site in 2000.

**Table 2.5.5. Quantities of Liquid Waste[a] Generated and Stored within the Tank Farm System on the Hanford Site in Calendar Year 2000 and in each of the Previous 5 Calendar Years, L (gal)**

| Type of Waste | 1995[a] | 1996[b] | 1997[b,c] | 1998[b,c] | 1999[b,c] | 2000[b] |
|---|---|---|---|---|---|---|
| Volume of waste added to double-shell tanks | 18,200,000 (4,808,000) | 2,420,000 (639,000) | 796,000 (210,000) | 1,715,000 (453,000) | 5,420,000 (1,432,000) | 8,920,000 (2,357,000) |
| Total volume in double-shell tanks (year end) | | 72,256,000 (19,090,000) | 69,245,000 (18,295,000) | 70,969,000 (18,750,000) | 73,290,000 (19,363,000) | 79,630,000 (21,038,000) |
| Volume evaporated at 242-AW | | 4,341,000 (1,147,000) | 3,800,000 (1,004,000) | 0 | 3,097,000 (818,000) | 2,580,000 (682,000) |
| Volume pumped from single-shell tanks[d] | | 630,000 (166,000) | 244,000 (64,000) | 859,000 (227,000) | 2,930,000 (774,100) | 2,250,000 (595,000) |

(a) Quantity of liquid waste is defined as liquid waste sent to double-shell underground storage tanks during these years. This does not include containerized waste (e.g., barreled) included in the solid waste category.
(b) Quantity of liquid waste is defined as shown by different categories on left-hand side of table during these years. This does not include containerized waste (e.g., barreled) included in the solid waste category.
(c) Quantity of liquid waste shown is corrected figure for these years.
(d) Volume does not include dilution or flush water.

**Table 2.5.6. Average Balance of Ten Hazardous Chemicals Stored in Greatest Quantity on the Hanford Site, 2000**

| Hazardous Chemical | Average Quantity, kg (lb) |
|---|---|
| Mineral oil | 1,700,000 (3,800,000) |
| Sodium | 1,000,000 (2,300,000) |
| Diesel fuel (Grades 1 and 2) | 440,000 (970,000) |
| Crystalline silica (quartz, cristobalite, tridymite) | 300,000 (650,000) |
| Bentonite | 270,000 (600,000) |
| Ethylene glycol | 250,000 (540,000) |
| Nitrogen | 130,000 (290,000) |
| Argon | 69,000 (150,000) |
| Sulfuric acid | 66,000 (150,000) |
| Propane | 40,000 (94,000) |